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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> <b>G11B 7/26, 23/00 // B29D 17/00</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 99/63535</b> <b>(43) International Publication Date:</b> 9 December 1999 (09.12.99)
<b>(21) International Application Number:</b> PCT/SE99/00910 <b>(22) International Filing Date:</b> 28 May 1999 (28.05.99)  <b>(30) Priority Data:</b> 9801934-2                      29 May 1998 (29.05.98)                      SE  <b>(71) Applicant (for all designated States except US):</b> OBDUCAT AKTIEBOLAG [SE/SE]; P.O. Box 580, S-201 25 Malmö (SE).  <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> OLSSON, Lennart [SE/SE]; Förridargatan 13, S-216 21 Malmö (SE).  <b>(74) Agent:</b> AWAPATENT AB; P.O. Box 5117, S-200 71 Malmö (SE).		<b>(81) Designated States:</b> AE, AL, AM, AT, AT (Utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, EE (Utility model), ES, FI, FI (Utility model), GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TO).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt of</i> <i>amendments.</i> <i>In English translation (filed in Swedish).</i>
<b>(54) Title:</b> RAW MATRIX FOR OPTICAL STORAGE MEDIA AND A METHOD OF MANUFACTURING SUCH A MATRIX  <b>(57) Abstract</b> <p>In a method of manufacturing a matrix for making optical storage media a plate-shaped matrix body is formed. Then a resist coating is applied on one side of the body by spinning a polymer over the body starting from a central portion of the body with a view to forming a blank for a matrix. Finally a central opening is formed in the body, preferably by punching the central portion of the body, thereby forming a raw matrix with a resist coating extending from the peripheral edge of the central opening.</p>		

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Raw matrix for optical storage media and a method of manufacturing such a matrix.

The present invention relates to a method of manufacturing a matrix for making optical storage media. The invention also relates to a blank for a matrix as well as a raw matrix.

5       When making optical storage media, such as compact disks, use is made of what is referred to as matrixes as a form for the information-carrying structure of the storage medium. The matrix constitutes one half of a mould for moulding said storage media. A matrix con-  
10       sists of a circular, planar plate of metal, in which a central opening is formed. The opening is used in the making of storage media.

In the methods that are traditionally used for making optical storage media, matrixes of metal are  
15       manufactured one by one by the matrixes being built up on a substrate provided with a pattern. This is time-consuming and costly work which comprises a plurality of steps of manufacture and which places high demands on advanced equipment for manufacturing  
20       the matrixes.

Therefore an object of the present invention is to provide an improved method of manufacturing matrixes for making optical storage media.

A specific object is to provide a rational method of  
25       manufacturing matrixes.

A special object is to ensure a high quality in the manufacture of matrixes.

According to the invention, these and other objects that will be apparent from the following description are  
30       now achieved by a method according to appended claim 1. The objects are also achieved by a blank for a matrix according to appended claim 6 and by a raw matrix according to appended claim 7. Preferred embodiments are defined in the dependent claims.

The invention is based on the idea of manufacturing in a first step a "raw matrix", which in a subsequent step is provided with an inscription by working the surface of the raw matrix.

5       According to a first aspect of the invention, a plate-shaped matrix body is formed, on which a resist coating, such as a photoresist coating, is applied on one side. This is achieved according to the invention by spinning a polymer over the body starting from a central  
10       portion of the body.

By spinning the polymer from the central portion, a uniform resist coating can easily be obtained over the entire plate-shaped body. Any irregularities are limited to the central portion.

15       After the forming of the resist coating, a central opening is formed in the body by removing the central portion, preferably by punching the central portion of the body. As a result, the entire resist coating will be uniform from the edge of the opening radially outwards.  
20       Thus the matrix can be provided with a high-quality inscription up to the edge of the opening.

By spinning, in accordance with the inventive concept, the resist coating from a central position and only then punching a central opening, a higher quality, a  
25       larger writing surface and lower manufacturing costs will be obtained than in the case where the resist coatings are spun after the opening has been punched.

The opening formed after removal of the central portion preferably constitutes the final opening which is  
30       used in the making of optical storage media. It is preferred for the matrix body to cover the entire central portion when applying the resist since the resist material can thus be spun from a single central position. However, the invention is not limited in this respect. It  
35       may in some cases be advantageous to form a smaller opening in the body and apply the resist starting from a central area round the smaller opening, whereupon the cen-

tral area is removed. Also this embodiment is included in the inventive concept as will be expressed in the appended claims.

5 In a preferred embodiment there is formed in a subsequent step an information-carrying inscription in the resist coating by an irradiation (exposure) and developing process in some prior art manner, whereupon a corresponding structure is formed in the matrix body by an etching or application process.

10 According to a second aspect of the invention, it comprises a blank for a matrix, which has a plate-shaped matrix body extending from a central portion to a circular peripheral line, and a resist coating extending radially outwards from the central portion of the body.  
15 The central portion is adapted to be removed in a subsequent step. No final central opening has thus yet been formed in the matrix body. In a particularly preferred embodiment, the blank has no opening at all inside the peripheral line.

20 According to a third aspect of the invention, it comprises a raw matrix with a plate-shaped matrix body, which has a central opening and a resist coating extending from the peripheral edge of the central opening and having a uniform thickness. The raw matrix, which in  
25 itself constitutes an intermediate product in the manufacture of a completed matrix, has thus been manufactured by forming a central opening in the matrix blank described above. Then no further change or working of the inner diameter or outer diameter is made after exposure  
30 or forming of structure, for instance by an etching or application process.

A preferred embodiment of the invention will now be described for the purpose of exemplification.

35 A matrix body in the form of a circular disk of nickel is formed. A suitable volume of a suitable resist material is placed in the centre of the disk, whereupon the disk is rotated so that the resist material is spun

to a uniform layer over the matrix body which then constitutes a blank for a matrix. Subsequently, the central portion of the disk is punched, thereby forming a raw matrix. The raw matrix undergoes lithographic processing, 5 in which an information-carrying pattern is exposed to radiation and developed according to prior art methods, so that the matrix body is uncovered in selected surface portions in a pattern corresponding to the information with which the matrix is to be provided. Then a structure 10 is etched into the matrix body in the uncovered surface portions. Finally the rest of the resist coating is removed, thereby forming a completed matrix with an information-carrying surface structure. Optionally the surface structure is given a protective treatment before 15 the matrix is ready for use.

## CLAIMS

1. A method of manufacturing a matrix for making  
5 optical storage media, characterised by the  
steps of  
forming a plate-shaped matrix body,  
applying a resist coating on one side of the body by  
spinning a polymer over the body starting from a central  
10 portion of the body, and  
forming, after said step of application, a central  
opening in the body provided with a resist coating by  
removing the central portion, preferably by punching the  
central portion of the body.
- 15 2. A method as claimed in claim 1, wherein said  
opening is formed such that the resist coating extends  
from a peripheral edge which defines said opening.
3. A method as claimed in claim 1 or 2, wherein the  
central opening is formed in the body before the resist  
20 coating is provided with an information-carrying inscription.
4. A method as claimed in claim 3, wherein the information-carrying inscription is formed in the resist coating by a subsequent exposure and developing process.
- 25 5. A method as claimed in claim 4, wherein a structure corresponding to the inscription in the resist coating is formed in the matrix body by an etching or application process.
6. A blank for a matrix for optical storage media,  
30 characterised by a plate-shaped matrix body  
extending from a central portion which is adapted to be removed, to a circular peripheral line, and a resist coating extending radially outwards from the central portion of the body.
- 35 7. A raw matrix for optical storage media,  
characterised by a plate-shaped matrix body,  
which comprises a central opening and a resist coating

extending from the peripheral edge of the central opening, the resist coating having a uniform thickness from said peripheral edge radially outwards.

- 5 8. A raw matrix as claimed in claim 7, which, with maintained dimensions of the body and the opening and after forming an information-carrying structure in the matrix body, is useable when making optical storage media.



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/SE 99/00910

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
IPC6: G11B 7/26, G11B 23/00 // B 29 D 17/00 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols)		
IPC6: G11B, B29D		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
SE,DK,FI,NO classes as above		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
EPAT, WPI, JAPIO		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9604652 A1 (BIFANO, THOMAS, G), 15 February 1996 (15.02.96) --	1-8
A	US 4954065 A (KOJI SHINDO ET AL), 4 Sept 1990 (04.09.90) --	1-8
A	US 4354988 A (CLAUDE BRICOT ET AL), 19 October 1982 (19.10.82) --	1-8
A	EP 0405568 A2 (E.I. DU PONT DE NEMOURS AND COMPANY), 2 January 1991 (02.01.91) --	1-8
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
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Date of the actual completion of the international search		Date of mailing of the international search report
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## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Patent Abstracts of Japan, abstract of JP 60-177452 A (DAICEL KAGAKU KOGYO K.K.), 11 Sept 1985 (11.09.85)  -- -----	1-8

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/SE 99/00910

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9604652 A1	15/02/96	CA 2195109 A	15/02/96
		CN 1159863 A	17/09/97
		EP 0772875 A	14/05/97
		JP 11501434 T	02/02/99
		US 5503963 A	02/04/96
		US 5783371 A	21/07/98
US 4954065 A	04/09/90	DE 3872907 A	27/08/92
		EP 0284387 A,B	28/09/88
		JP 63237234 A	03/10/88
US 4354988 A	19/10/82	CA 1157607 A	29/11/83
		EP 0015834 A,B	17/09/80
		SE 0015834 T3	
		FR 2450683 A,B	03/10/80
		JP 56051031 A	08/05/81
		US 4407646 A	04/10/83
EP 0405568 A2	02/01/91	CA 2020175 A	31/12/90
		CN 1048619 A	16/01/91
		DE 69024415 D,T	31/10/96
		HK 144496 A	09/08/96
		JP 2116959 C	06/12/96
		JP 3116564 A	17/05/91
		JP 8027996 B	21/03/96
		US 5188863 A	23/02/93